Malina Software Corp. - Principal Research Initiatives

Bran Selić
President and Founder
Malina Software Corp.
Primary Research Initiatives

- **Commissariat a l’Energie Atomique (CEA) - FRANCE**
  - Laboratoire LIST-LISE
  - Methods and Standards for Modeling and Analysis of Real-Time and Embedded Systems

- **Simula Research Laboratory - NORWAY**
  - CERTUS Centre
  - Methods for model-based specification of complex integrated control systems

- **Network for Engineering of Complex Software-Intensive Systems for Automotive Systems (NECSIS) - CANADA**
  - Model-based methods and technologies for the development of automotive systems

- **University of Sydney - AUSTRALIA**
  - Model-based engineering for business process modeling
  - Fault-tolerance for high-performance computing
Simula Research
About Simula Research Labs

- Research institute created by the Norwegian Ministry of Education and Research

- Objectives:
  - Basic and long-term research in networks, distributed systems, scientific computing, and software engineering
  - Promote the application of research in public and private sectors
  - Educate students at master’s, doctoral, and post-doctoral levels

- Various research domains
  - Software estimation, cardiac modeling, biomedical computing, computational geoscience, networks, media
  - Certus centre: software V&V
Purpose:
- Develop new and improved methods and tools for modeling, certifying, and testing of critical software systems

Supported by:
- The Research Council of Norway and its Centre for Research-Based Innovation

Established in September 2011
- 8-year mandate (2011-2019)
- ~10 MNOK/year (~US$ 1.75M/year)
- 7 permanent scientists, 7 PhD students, 4 adjunct researchers

Initiated by Prof. Lionel Briand (U. of Luxembourg) and led by Dr. Arnaud Gotlieb
CERTUS Industry Partners

- All research projects are industry driven:
  - CISCO Systems Norway
  - ESITO
  - FMC Technologies
  - KONGSBERG Maritime
  - TOLL customs and excises
CERTUS Technical Strategy

- Use of model-based engineering (MBE) methods, tools, and standards

- Current focus on
  - Certification and verification of real-time and embedded software
  - Modeling, configuring, and testing of complex product families
  - Automated testing of data-intensive software systems

- OMG industry standards used:
  - Unified Modeling Language (UML)
  - Modeling and Analysis of Real-time and Embedded Systems (MARTE) - a UML profile
  - Systems Modeling Language (SysML)
NECSIS
An industry-academia collaborative research project to develop new model-based methods and technologies for automotive software development

Funded by Automotive Partnership Canada

Duration: 2010-2016

Budget: C$15.5M over 5 years (~C$3M/yr)

Industrial participants:
- GM Canada, IBM Canada, Malina Software Corp.

Academic participants:
NECSIS Structure

**Theme 1: Capturing and Sharing Knowledge**
- Domain-specific abstractions and notations
- Cognitive support for developers
- Distributed collaborative development
- Model visualization

**Theme 2: Reasoning Analysis and Transformation**
- Model management
- Automated (formal) model analysis
- Model testing and simulation
- Model transformations

**Theme 3: Uncertainty, Adaptability, and Variability**
- Feature-oriented modeling
- Flexible architectures
- Software product-line engineering

**Theme 4: Process and Practice**
- Relationships between models
- Cross-cutting concerns (e.g., safety))
- Data and semantic integration
NECSIS Expertise
Projects and Themes

**Projects**
- feature perspective
- cross-cutting properties
- domain-specific abstractions
- flexible architectures
- software product lining
- model management
- model testing and debugging
- Integrated simulation
- human/model interactions
- distributed collaboration

**Theme 1 - Cognition/Collaboration**
- (domain-specific) modelling notations
- cognitive support for developer
- distributed collaboration
- model visualization

**Theme 2 - Automation**
- model composition / integration
- automated analysis
- testing and simulation
- model transformations

**Theme 3 - Adaptability**
- feature-oriented modelling
- flexible architectures (e.g., AUTOSAR)
- software product lining

**Theme 4 - Pragmatics**
- relationships between models
- cross-cutting concerns
- data and semantic integration
Interrelated Projects